BRAZILIAN PEPPERTREE

by

Fernando Mc Kay and Natalia Cuadra

Cooperator: Greg Wheeler, USDA-ARS Invasive Plant Research Lab, Fort Lauderdale, FL.

Abstract

During the reporting period, efforts were mainly focused to study the stem galling insects: *Crasimorpha infuscata* Hodges (Lepidoptera: Gelechiidae), *Allorhogas* sp. (Hymenoptera: Braconidae) and unidentified Gelechiidae. Two field surveys were conducted in September 2010 and May 2011. A total of 670 (340 closed + 330 open) stem galls were collected in Corrientes and Misiones Provinces. ***Field host range.*** Coexisting plants of *Astronium balansae*, *Lithrea molleoides, S. lentiscifolius, S. longifolius, S. molle, S. terebinthifolius* and *S. weinmannifolius* were visually inspected for stem galls. Galls of *C. infuscata* and *Allorhogas* sp. were only found on *S. terebinthifolius* plants. Unidentified Gelechiidae small stem galls were found on *S. terebinthifolius* and possibly on *L. molleoides* (*ca.* 30). ***Crasimorpha infuscata.*** *Laboratory host specificity*. No-choice larval survival is being evaluated on BP and three Anacardiaceae species.

For general information and background of the project, see previous SABCL Annual Reports and/or visit www.usda-sabcl.org.

Materials and methods

Two exploratory trips were made in September 2010 and May 2011 throughout Corrientes and Misiones Provinces. A roadside survey of Brazilian peppertree plants and other Anacardiaceae populations was conducted along main and secondary roads. Plants were sampled by visual inspection and insects were collected by hand and by rearing infested plant material (e.g. fruits, galls). Once at the lab, galls were kept in rearing chambers under controlled conditions (25±1°C T; 60±5% RH; 14:10L:D) for subsequent emergence of adult specimens.

Results

September 2010 field trip

Crasimorpha infuscata. Field host range: A total of 490 (160 closed + 330 open) stem galls were collected (Table 1). At one site, coexisting plants of *S. terebinthifolius* (50); *S. molle* (30) and *Lithrea molleoides* (1) were visually inspected for stem galls. Galls (60) were only found on *S. terebinthifolius* plants.

Rearing and testing: Five to ten newly emerged adults were placed in 3-liter plastic containers with perforated lids and moist tissue paper in the bottom. Bouquets of freshly excised leaves with their petioles inserted in small recipients filled with water were provided and replaced every 48 hours and the eggs harvested. A piece of cotton soaked in water-sucrose solution tied with a wire and hung from the top of the sleeve constituted the adults' food source. Leaves containing eggs were kept in 1-liter plastic containers with perforated lids and moist tissue paper in the bottom and kept in environmental chambers (25±2°C: 60-80% RH; 16:8 L:D) for larvae emergence. Newly emerged larvae were used to conduct preliminary no-choice larval survival tests.

Experiments were carried on potted plants placed inside $8m^3$ outdoor cages (Fig. 1). In each replicate, 5 newly emerged larvae were placed on the shoot tips of test plants. Tests are in progress. So far, we have registered 7 newly form galls on the shoots of *S. terebinthifolius* and only 1 gall on *Lithrea molleoides* (Table 2). Stems of the plant exposed to the insects will be monitored during the following months until adult emergence.

Natural enemies: Two parasitoids emerged from *C. infuscata* stem galls: *Copidosoma teciae* Blanchard (Hymenoptera: Chalcidoidea) (identified by Daniel Aquino, Facultad de Ciencias Naturales y Museo, La Plata, Buenos Aires, Argentina) (Fig. 2) and *Ephialtes (Calliephialtes) gallicola*? Costa Lima (Hymenoptera: Ichneumonidae) (Fig. 3). *C. teciae* is known to bred from galls of other Gelechiidae, *Tecia mendozella* Strand, which produces galls on the stems of *Baccharis rosmarinifolia* (=*linearis*) (Blanchard 1940; De Santis 1967; Noyes 2003). These two parasitoids were also bred by Krauss (1963) from *C. infuscata* galls collected in Brazil.

Allorhogas sp. Laboratory rearing is being attempted from 15 immature galls collected in Misiones. Newly emerged adults (15) were confined inside an insect rearing sleeve (20 cm in diameter by 60 cm in length) wrapped around branches of potted *S. terebinthifolius* (Misiones haplotype). A piece of cotton soaked in water-sucrose solution tied with a wire and hung from the top of the sleeve constituted the adults' food source. Adults were alive for 15 days. Stems exposed will be monitored for the appearance of galls.

May 2011 field trip

Crasimorpha infuscata. A total of 180 galls were collected at eleven sites (Table 3). Field host range: At eight sites, coexisting plants of *S. terebinthifolius* (160); *S. molle* (63); *S. longifolius* (2); *S. lentiscifolius* (8), *S. weinmannifolius* (25) and *Lithrea molleoides* (28) were visually inspected for stem galls. Galls of *C. infuscata* (100) and *Allorhogas* sp. (*ca.* 80) were only found on *S. terebinthifolius* plants. An unidentified Gelechiidae small stem galls were found on *S. terebinthifolius* (*ca.* 100) and possibly on *L. molleoides* (*ca.* 30).

Allorhogas sp. Laboratory rearing of this insect is being attempted. Newly emerged adults (10) will be confined inside insect rearing sleeve (20 cm in diameter by 60 cm in length) wrapped around branches of potted *S. terebinthifolius* (Misiones/Florida haplotype) plant. A piece of cotton soaked in water-sucrose solution tied with a wire and hung from the top of the sleeve constituted the adults' food source. Plants will be kept in a greenhouse. Additionally, about 50 galls will be placed at the bottom of an $8m^3$ cage set up outdoors containing 6 BP (3 Florida/3 Misiones type) potted plants. Stems of the plants used on both experiments will be monitored during the following days/months for the appearance of galls.

Unidentified Gelechiidae. Good numbers of galls were collected at eight sites (Table 3) and kept in rearing chambers (25±1°C T; 60±5% RH; 14:10L:D) for subsequent emergence of adults. Emerged adult specimens will be use both for rearing and identification.

Anacardiaceae spp. fruit collection. Fruits of *S. terebinthifolius, S. molle* and *S. lentiscifolius* were collected at different sites of Misiones Province and kept in rearing chambers (25±1°C T; 60±5% RH; 14:10L:D) for subsequent emergence of adults.

New findings

- *Lithraeus atronotatus* or near were obtained from fruits of *S. lentiscifolius* and *S. molle*. Specimens will be sent to taxonomist to confirm the identification (Fig. 4).
- Unidentified Gelechiidae small stem galls (possibly same as found on *S. terebinthifolius*) were found on *L. molleoides* (Fig. 5)
- Stem galls from *S. lentiscifolius* and *S. longifolius* were found (Figs. 6 and 7). Galls are being kept in rearing chambers for emergence of adults.

Field trips to survey for BP natural enemies and to collect Anacardiaceae for cultivation
September 21-28, 2010. Corrientes and Misiones. Mc Kay and Parisi.
May 8-14, 2011. Corrientes and Misiones. Mc Kay and Cuadra.

Significant accomplishments

- The finding of high densities of *Crasimorpha infuscata*
- Laboratory host specificity tests of *C. infuscata* were started.
- Abundant collections made of *C. infuscata*; *Allorhogas* sp. and the Gelechiidae.
- Good progress on field host range data of these insects.

Future plans

- *Crasimorpha infuscata*
    - Conduct additional replications of larval development no-choice tests with Anacardiaceae, and other families of the Sapindales (Meliaceae, Rutaceae and Sapindaceae) (see tentative test plant list; Table 2). Conduct additional field surveys on native Anacardiaceae.
    - Conduct biological studies (adult longevity, preoviposition period and fecundity)

- Attempt laboratory rearing of *Allorhoras* sp. and Lepidoptera stem gallers.
- Conduct additional exploratory trips during different seasons to continue searching for new natural enemies in Argentina and Brazil.

References Cited

Blanchard, E.E. 1940, Apuntes sobre Encirtidos argentinos. *Anales de la Sociedad Cientifica Argentina* **130**:107 (Parasitoid identification correct).
De Santis, L. 1967, *Catálogo de los Himenópteros Argentinos de la Serie Parasitica, incluyendo Bethyloidea* pp.166 Comision de Investigacion Cientifica, La Plata
Krauss, N. L. 1963. Biological control investigations on Christmas berry (*Schinus terebinthifolius*) and Emex (*Emex* spp.). Proc. Hawaiian Entomol. Soc.18: 281-287.
Noyes, J.S. 2003. Universal Chalcidoidea Database. World Wide Web electronic publication. www.nhm.ac.uk/entomology/chalcidoids/index.html [accessed 18-Nov-2010]

Table 1. *Crasimorpha infuscata*: Field survey on *S. terebinthifolius* and other Anacardiaceae in northeastern Argentina (21-28, September 2010).

Date and locality	Plant species	N° of surveyed plants	N° of collected galls	
			closed	open
Corrientes, RN° 14, near Virasoro 22 September 2010 Mc Kay col.	*S. terebinthifolius* *Lithrea molleoides* *S. molle*	50 1 30	12 0 0	48 0 0
Misiones, RN° 14, near Oberá 22 September 2010 Mc Kay col.	*S. terebinthifolius*	10	0	2
Misiones, RN° 20, near San Pedro 22 September 2010 Mc Kay col.	*S. terebinthifolius*	50	2	10
Misiones, RN°12, Urugua-í dam 23 September 2010 Mc Kay col.	*S. terebinthifolius*	20	1	4
Misiones, RN° 12, near Montecarlo 23 September 2010 Mc Kay col.	*S. terebinthifolius*	20	3	2
Misiones, RN° 12, Garuhapé-Mi 23 September 2010 Mc Kay col.	*S. terebinthifolius*	60	8	20
Misiones, RN° 12, 14 km S Capioví 24 September 2010 Mc Kay col.	*S. terebinthifolius*	150	134	244

Table 2. Tentative test plant species to evaluate *Crasimorpha infuscata* host specificity (larval development no-choice tests) in Argentina.

Test plants	***Status* in Argentina**	**Repetitions conducted in October 2010**	**Number of stem galls**	**Repetitions conducted in July 2011**
Order Sapindales				
Family Anacardiaceae				
Astronium balansae	Native			
Lithrea molleoides	Native	**5**	**1**	**5**
Mangifera indica	Exotic			
Pistacia integerrima	Exotic	**5**	**0**	
Pistacia vera	Exotic			
Schinopsis balansae	Native			
Schinus areira	Native			**3**
Schinus lentiscifolius	Native	**5**	**0**	**5**
Schinus longifolius	Native			**5**
Schinus molle	Native			
Schinus terebinthifolius	Native	**6**	**7 (3; 1; 1;0; 0; 2)**	**5**
Family Meliaceae				
Cabralea canjerana	Native			
Cedrela fissilis	Native			
Family Rutaceae				
Fagara rhoifolia (tembetari)	Native			
Family Sapindaceae				
Cardiospermum grandiflorum	Native			
Koelreuteria elegans	Exotic			
Sapindus saponaria	Native			

Table 3. Field survey on *S. terebinthifolius* and other Anacardiaceae in northeastern Argentina (May 2011).

Date and locality	Plant species	N° of surveyed plants	N° of galls			
			C. infuscata	***Allorhogas* sp.***	**Gelechiidae***	**Other**
Misiones, RN° 12, near San Ignacio 10 May 2011	*S. terebinthifolius*	5	0	**	**	0
	L. molleoides	5	0	0	*?	0
Misiones, RN° 12, Near Capioví 10 May 2011	*S. terebinthifolius*	100	61	***	***	0
Misiones, Garuhapé-Mí, 10 May 2011	*S. terebinthifolius*	60	14	**	**	0
Misiones, RN° 12, Puerto Libertad 10 May 2011	*S. terebinthifolius*	30	5	*	*	0
Misiones, RN° 103, near Santa Ana 12 May 2011	*S. terebinthifolius*	25	3	*	*	0
	S. molle	20	0	0	0	0
	L. molleoides	2	0	0	0	0
	A. balansae	1	0	0	0	0
Misiones, RN° 105 and RN°14 crossroad, 12 May 2011	*S. terebinthifolius*	10	9	*	*	0
	L. molleoides	8	0	0	0	2
	S. molle	2	0	0	0	0
	S. lentiscifolius	5	0	0	0	0
Misiones, RN° 105, near Apóstoles 12 May 2011	*S. terebinthifolius*	35	5	**	**	0
	L. molleoides	10	0	0	*?	0
	S. molle	10	0	0	0	0
	S. lentiscifolius	3	0	0	0	3
	S. longifolius	2	0	0	0	3

Date and locality	Plant species	N° of surveyed plants	N° of galls			
			C. infuscata	*Allorhogas* sp.*	Gelechiidae*	Other
Misiones, RN° 105,	*S. weinmannifolius*	10	3	0	0	0
20 km SE Posadas	*S. molle*	3	0	0	0	0
12 May 2011	*L. molleoides*	3	0	0	0	0
Corrientes, RN° 120,	*S. terebinthifolius*	40	31	0	0	0
30 km N Virasoro	*S. molle*	20	0	0	0	0
13 May 2011	*L. molleoides*	15	0	0	0	0
Misiones, RN° 14,	*S. terebinthifolius*	30	27	*	*	0
near Virasoro	*S. molle*	30	0	0	0	0
12 May 2011						
Misiones, RN° 14,	*S. terebinthifolius*	45	25	0	0	0
Kkm 728	*S. molle*	25	0	0	0	0
12 May 2011	*S. weinmannifolius*	15	10	0	0	0

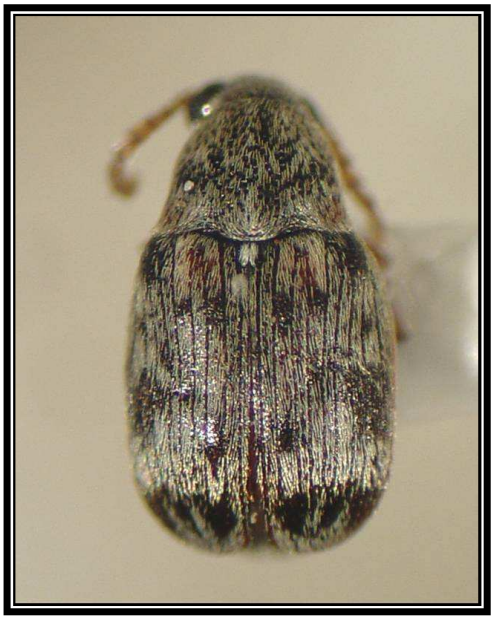
Abundance: *, <10 galls; **, 11-50 galls; ***, > 50 galls.

1

2

3

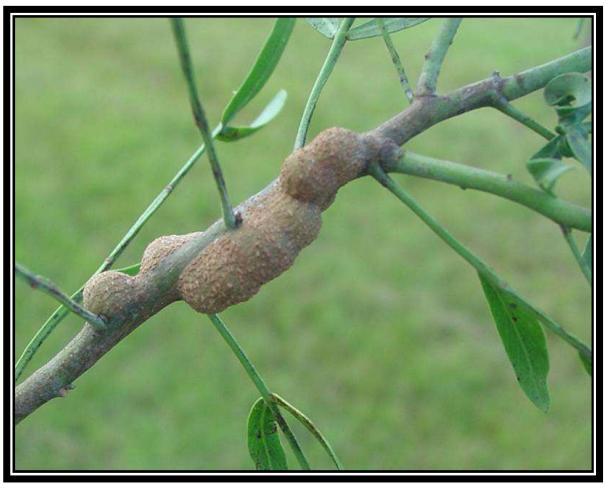
4b



4a

Figures 1 - 4. 1- Outdoor cage with the test plants used in the no-choice larval survival test of *C. infuscata*. **2 & 3-** *C. infuscata* parasitoids. **2-** *Copidosoma teciae*. **3-** *Ephialtes (Calliephialtes) gallicola*?. **4-** Bruchidae emerged from *S. molle* (a) and *S. lentiscifolius* (b) fruits.

5



6

7

Figures 5-7. Stem galls on Anacardiaceae. **5-** *Schinus longifolius*. **6-** *S. lentiscifolius*. **7-** *Lithrea molleoides*.